

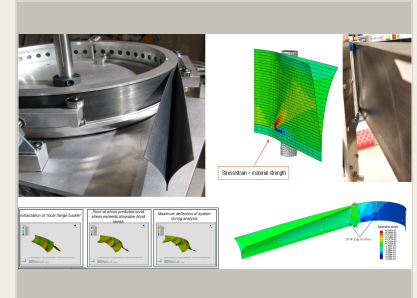
Bonding and Analysis of Composite TRAC Booms for NASA Science Missions, Phase II

Completed Technology Project (2017 - 2019)



Project Introduction

A new deployable spacecraft boom technology called the Triangular Rollable And Collapsible Boom (TRACTM Boom), invented by the Air Force Research Laboratory and exclusively licensed by Rocco, is being considered by NASA for numerous missions including the Comet Rendezvous, Sample Acquisition, Isolation, and Return (CORSAIR) mission being developed by NASA Goddard. For CORSAIR, NASA has baselined a rather robust high strain composite (HSC) TRAC Boom to tether a comet Sample Acquisition and Retrieving Projectile (SARP) to the spacecraft and prevent the harpoon-like penetrator from recoiling back and impacting the spacecraft during retrieval. However, questions remain as to how to design and build a composite TRAC Boom with sufficient strength so as to tolerate the relatively long storage time (several years in-transit to the comet) and relatively high deployment speeds (~ 30 - 150 f/s) necessary for the CORSAIR harpoon system. To address this challenge during Phase II, Rocco proposes to improve the performance of the bondline in composite TRAC Booms by reinforcing the adhesive joint and developing mechanical end fittings that allow higher packaging strains while minimizing creep. We also propose to validate a relatively low cost, out-of-autoclave process for affecting the bond, and validate analytical models to simulate the time- and temperature-dependent viscoelastic behavior of composite TRAC bonded joint, and guide engineering qualification of the joints for future NASA missions, including CORSAIR. Moreover, Rocco will also further optimize the system design, including proximal and distal end fittings that connect TRAC Boom into the CORSAIR storage canister and sample return projectile to validate strength and creep performance to mission requirements, and to incorporate load-limiting features that prevent catastrophic failure of the TRAC boom during operation.



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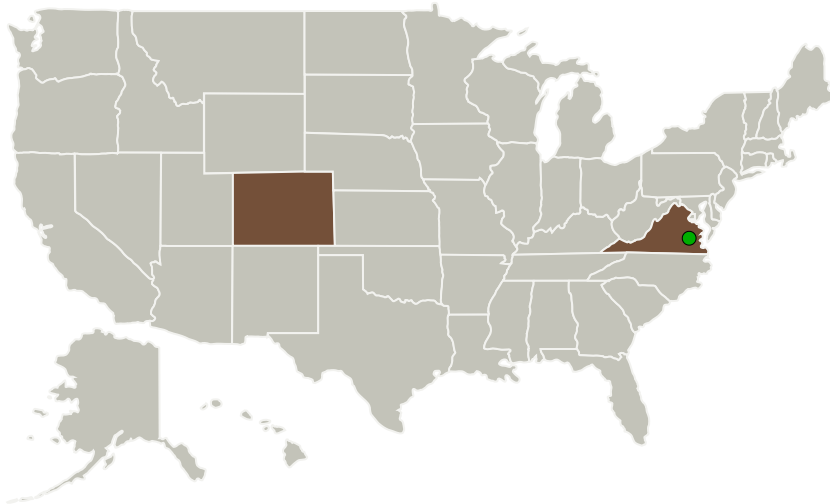
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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Roccor, LLC	Lead Organization	Industry	Longmont, Colorado
● Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
Colorado	Virginia

Project Transitions

May 2017: Project Start

April 2019: Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/141111>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Roccor, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

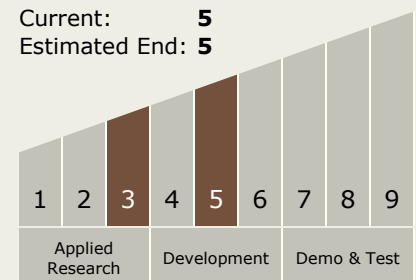
Carlos Torrez

Principal Investigator:

Dana Turse

Technology Maturity (TRL)

Start: **3**
 Current: **5**
 Estimated End: **5**

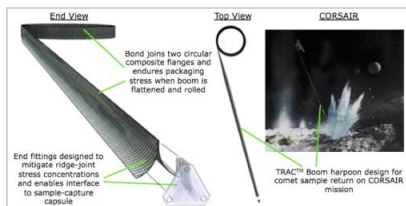


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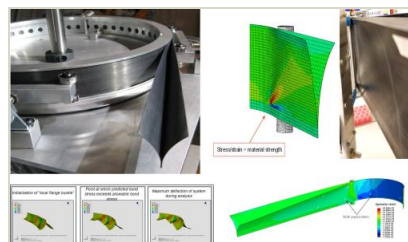
Images



Briefing Chart Image

Bonding and Analysis of Composite TRAC Booms for NASA Science Missions, Phase II Briefing Chart Image

(<https://techport.nasa.gov/image/128762>)



Final Summary Chart Image

Bonding and Analysis of Composite TRAC Booms for NASA Science Missions, Phase II

(<https://techport.nasa.gov/image/134921>)

Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
 - └ TX12.3 Mechanical Systems
 - └ TX12.3.1 Deployables, Docking, and Interfaces

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System